

REMARKS

The Office Action mailed April 5, 2002, has been reviewed and the comments of the Patent and Trademark Office have been considered. Claims 2 and 12 have been amended. Claims 1-12 are pending for consideration.

Rejections under 35 U.S.C. §§ 102 and 103

Claims 1-8 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,939,028 to Bennett et al. (hereafter "Bennett"). Claim 12 stands rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,776,417 to Frost et al. (hereafter "Frost"). Claim 9 stands rejected under 35 U.S.C. § 103 as being unpatentable over Bennett in view of Frost. Claims 10 and 11 stand rejected under 35 U.S.C. § 103 as being unpatentable over Bennett in view of U.S. Patent No. 6,029,441 to Mizuno et al. (hereafter "Mizuno"). Insofar as these rejections pertain to the claims as amended, applicants respectfully traverse.

A purpose of the present invention is the suppression of CO exhaust by rapidly raising the temperature of a CO oxidation catalyst so as to reduce the light-off time thereof. The inventors of the present applicant have found that unused energy included in exhaust gas may be used in accelerating the heating of the CO oxidation catalyst. Specifically, the present inventors have found that the adsorption heat or condensation heat of H₂O caught into a H₂O trap can be used to raise the temperature of the CO oxidation catalyst (see present specification, page 2, lines 1-18).

In the presently claimed invention, the H₂O trap and the CO oxidation catalyst are arranged to provide the accelerated heating to the CO oxidation catalyst. For example, both independent claims 1 and 11 include an H₂O trap disposed upstream and close to a CO oxidation catalyst. In independent claim 2, as amended, the exhaust emission control device includes an underfloor catalyst wherein a CO oxidation catalyst and a H₂O trap are coated on a support; and a HC trap is disposed upstream of the H₂O trap. Thus, in this arrangement, the H₂O trap is downstream of HC trap and therefore closer to the CO

oxidation catalyst. This arrangement allows the heat at the H₂O trap to be conducted to the CO oxidation catalyst more effectively. In independent claim 12, as amended, the exhaust emission control device includes an underfloor catalyst wherein a low temperature light off CO oxidation catalyst and a H₂O trap are coated on a support; a secondary air supply unit is disposed upstream of the underfloor catalyst; and a HC trap is disposed upstream of the secondary air supply. In this arrangement air containing H₂O is conducted directly to the H₂O trap and the CO oxidation catalyst directly downstream of the H₂O trap is heated. Further, in this arrangement, the HC trap is upstream of the secondary air supply, which is upstream of the underfloor catalyst including the H₂O trap. Thus, in claim 12, as in claim 2, the HC trap is upstream of the H₂O trap. In all of the independent claims, 1, 2, 11 and 12, the H₂O trap and the CO oxidation catalyst are arranged to provide heating from the H₂O trap to accelerate the heating of the CO oxidation catalyst.

By contrast, in the Bennett device, the water trap is arranged simply to remove water from the system to keep the CO oxidation catalyst, and if used, an HC catalyst, dry, not to accelerate the heating of the CO oxidation catalyst. According to the disclosure of Bennett, the water in an exhaust gas affects the operation of the CO oxidation catalyst (col. 8, lines 21-23). The water trap and CO oxidation catalyst arrangement of Bennett is such that the CO oxidation catalyst is effectively dried, and therefore the light-off time is reduced (col. 8, lines 35-42). However, in contrast to claims 1 and 11 of the present application, Bennett fails to suggest arranging the H₂O trap close to the CO oxidation catalyst. A close proximity of the H₂O trap and the CO oxidation catalyst is not necessary in Bennett, because the H₂O trap need only remove water upstream from the CO oxidation catalyst, it need not remove water close to the CO oxidation catalyst.

With respect to claim 2, Bennett further discloses an underfloor catalyst in which a CO oxidation catalyst and a water trap are coated on a support according to one of the disclosed embodiments. Bennett discloses, however, that in this case the water trap should be arranged upstream of the HC trap if the HC trap is employed (col. 8, lines 24-25).

According to Bennett, such an arrangement keeps the HC trap as well as the CO oxidation catalyst dry (col. 8, lines 3-9). Thus, Bennett clearly teaches away from the relative arrangement of the H₂O trap, HC trap, and CO oxidation catalyst as recited in claim 2.

Moreover, it would not have been obvious to one skilled in the art to modify Bennett to arrange the HC trap upstream of the H₂O trap. As discussed above, Bennett clearly teaches away from the arranging the HC trap upstream of the H₂O trap, because Bennett discloses that the HC trap should be arranged downstream of the H₂O trap, so that the HC trap remains dry.

As mentioned above, claim 12 was rejected as anticipated by Frost. Applicants respectfully traverse. As discussed above, claim 12 requires that the HC trap is arranged upstream of the H₂O trap. Frost suggests just the opposite. Frost, like Bennett, suggests that the HC trap should be kept dry. Thus, Frost suggests that a water trap should be upstream of the HC trap or part of the same structure (see col. 2, lines 41-51).

For the reasons given above, applicants submit that all of the independent claims, 1, 2, 11 and 12, and claims depending therefrom, are patentable over the art cited in the rejection of the claims. Accordingly applicants respectfully request that the rejection of the claims under 35 U.S.C. §§ 102 and 103 be withdrawn.

CONCLUSION

In view of the foregoing amendments and remarks, applicants respectfully submit that all of the pending claims are now in condition for allowance. An early notice to this effect is earnestly solicited. If there are any questions regarding the application, the Examiner is invited to contact the undersigned at the number below.

Respectfully submitted,

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Versions with Markings to Show Changes Made

In the Claims:

2. An exhaust emission control device of an internal combustion engine, comprising[;]:
an underfloor catalyst wherein a CO oxidation catalyst and a H₂O trap are coated on a support; and
a HC trap disposed upstream of the H₂O trap.

12. An exhaust emission control device of an internal combustion engine, comprising[;]:
an underfloor catalyst wherein a low temperature light-off CO oxidation catalyst and a H₂O trap are coated on a support;
a secondary air supply unit disposed upstream of the underfloor catalyst; and
a HC trap disposed upstream of the secondary air supply.